CLINICAL ASSESSMENT OF MAXILLARY LABIAL AND MANDIBULAR LINGUAL FRENUM AND RELATIONSHIP BETWEEN THE UPPER MIDLINE SPACE AND MAXILLARY LABIAL FRENUM IN 3-14 YEARS SCHOOL GOING CHILDREN OF CHENNAI CITY

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CERTIFICATE

This is to certify that this dissertation titled **"CLINICAL ASSESSMENT OF MAXILLARY LABIAL AND MANDIBULAR LINGUAL FRENUM AND RELATIONSHIP BETWEEN THE UPPER MIDLINE SPACE AND MAXILLARY LABIAL FRENUM IN 3-14 YEARS SCHOOL GOING CHILDREN OF CHENNAI CITY"** is a bonafide record of work done by **Dr. S. Rajakumar,** under my guidance during his postgraduate study period between **2010– 2013**.

This dissertation is submitted to **THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY**, in partial fulfillment for the degree of **Master of Dental Surgery in Branch VIII –Pedodontics and Preventive Dentistry**.

It has not been submitted (partially or fully) for the award of any other degree or diploma.

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ABSTRACT

BACKGROUND AND AIM:

Frenum is a dynamic and changeable structure and subject to variations in shape, size and location at different stages of growth and development. Abnormal frenum causes variety of clinical problems such as speech and deglutition changes which may have influence on growth and development. The clinician should consider frenal assessment during routine clinical examination and treatment planning.

The aim of the present study was to clinically assess the maxillary labial and mandibular lingual frenum and relationship between the midline diastema and maxillary labial frenum in 3-14 years school going children of Chennai city.

METHODOLOGY:

A total of 951 children were clinically examined for the maxillary and mandibular labial frenum attachments and maxillary labial frenum morphology and midline diastema. All the findings were recorded in the proforma and data was analyzed statistically.

RESULTS:

The simple frenum (n=822) morphology and mucosal level (602) of frenum attachment was the most prevalent type of maxillary labial frenum,

N-1 type (870) of frenum is the most prevalent lingual frenum. The level of gingival insertion moves apically with age. Persistence of papillary type of frenal attachment causes midline diastema. No association between frenum morphology and midline diastema, frenum attachment and morphology was noticed.

CONCLUSION:

It can be concluded that the frenum attachment level in children shift to a more apical position with increasing age. The persistence of the papillary type of attachment in the permanent dentition is associated with diastema. Whereas no association between morphology and attachment, morphology and diastema. The dentist should give due importance for the labial and lingual attachment levels and midline diastema during routine clinical examination and should have a thorough knowledge about when to intervene with the abnormal frenum and correct treatment planning.

KEY WORDS:

Labial frenum, Lingual frenum, Midline diastema.

INTRODUCTION

A frenum is a fold of mucous membrane usually with enclosed muscle fibers that attaches the lips and cheeks to alveolar mucosa and / or gingiva and underlying periosteum both in the maxilla and in the mandible.[1] Labial frenum provides stability and support for the upper lip. It is also called as Maxillary frenum or frenulum labii superioris.[2] The lingual frenulum or tongue's frenulum connects the tongue to the floor of the mouth, allowing free movement of the tongue. The lingual frenulum is a median fold of mucosa that joins the tongue's posterior-inferior surface and gingival tissue that covers the lingual surface of the anterior alveolar ridge.[3] Frenum is a dynamic and changeable structure and is subjective to variations in shape, size and location where the frenum inserts into the soft tissue covering the alveolar processes, at the different stages of growth and development.[4,5] The eruption of the primary incisors, the development of the maxillary sinus and vertical growth of the alveolar process make the insertion of the frenum move apically.[6] At birth the frenum extends to the palatal papilla.[7] When alveolar growth exceeds the vertical and transverse growth of the frenum, it modifies its position bucally towards the alveolar crest.[8,9,10] This change in position during child growth was believed to be caused by the frenum's static position while the surrounding structures grow.[11,12]

In children, the maxillary labial frenum has been associated with several clinical problems. It has been associated with midline diastema that prevents the contact between central incisors, which can complicate orthodontic therapy and can contribute to post orthodontic relapse.[13] The maxillary labial frenum is also a local anatomic factor that affects the accumulation and retention of plaque and can interfere with effective tooth brushing.[14] Similarly the developmental anomaly of lingual frenum-ankyloglossia (tongue-tie), is an anomaly which is characterized by alteration in the tongue's frenulum resulting in restriction of tongue tip mobility,[15] leading to speech and deglutition changes.[3]

When the lingual frenum is short it influences the swallowing pattern because of restricted upward movement resulting in maxillary protrusion and anterior open bite.[16] During growth and development, the upward pressure of the tongue creates the width and shape of the palate, but if the lower lingual frenum is short, the tongue will not generate enough upward pressure to create a normal palate resulting in narrow and under developed palate.[17]

Placek et al[10] introduced a clinical classification of maxillary frenum insertion depending on the anatomic location of attachment to help clinicians identify functional problems requiring interventions. They classified frenum attachment based on mucogingival junction, the attached gingiva, the interdental papilla and through the interdental papilla right up to the palate. The maxillary labial frenum morphology was described by Sewerin et al.[18]

The lingual frenum attachment based on appearance was given by Northcutt ME.[17]

The midline diastema is a space or gap between the maxillary central incisors which is greater than 0.5mm.[19] This space can be a normal growth characteristic during the primary and mixed dentition and generally is closed by the time when maxillary canines erupt.[8] For most children, the medial erupting path of the maxillary lateral incisors and maxillary canines, as described by Broadbent, results in normal closure of the space. For some individuals however, the diastema does not close spontaneously.[20] Various etiological factors were claimed responsible for midline diastema to persist even after the complete eruption of the permanent dentition. One among them is the frenum. The studies showed frenum as a positive and negative factor responsible for midline diastema.[4, 21, 22, 23] It was thought that the labial frenum interfered with the closure of midline diastema.[13,23,24,25,26,27] This belief resulted in a misdiagnosis and unnecessary surgical interventions of the frenum.[23]

There are no clear cut guidelines available in the literature about when to intervene with labial and lingual frenum abnormalities and no studies available to establish a relationship between the different types of frenum morphologies and the presence of midline diastema in children.[28] The knowledge about all these factors is essential for the successful management of frenum associated clinical problems.

Hence, the present study was undertaken to find the prevalence of frenum attachment levels and frenum morphology and their relation to diastema in school going children of 3-14 years age group from five various Schools of Chennai City, Tamil Nadu.

AIMS AND OBJECTIVES

1) To determine the prevalence of attachment levels of maxillary labial frenum.

2) To determine the prevalence of morphological types of maxillary labial frenum.

3) To determine the prevalence of different types of lingual frenum.

4) To determine the association between the maxillary labial frenum attachment levels and midline diastema.

5) To determine the association between the maxillary labial frenum morphology and midline diastema.

6) To determine the association between the maxillary labial frenum attachment and morphology.

REVIEW OF LITERATURE

Sewerin I (1971)[18] established the various frenum typology (Maxillary labial frenal morphology). A total of 1430 subjects of age group 0 to 60 years were included in the study and various types of labial frenum morphologies were assessed by its appearance. The classification system was given based on the diverse frenal morphological conditions and various terminologies were assigned as simple frenum, simple frenum with appendix, simple frenum with nichum and lateral labial frenum, simple frenum with nodule, simple with nodule and lateral labial frenum, bifid frenum, persistent tectolabial, double frenum and absence of frenum. Later Sewerin I (1971) introduced a modified typology (maxillary labial frenum morphology) which includes simple frenum, simple frenum with appendix, simple frenum with nodule, persistent tectolabial, double frenum, simple frenum with nichum, bifid frenum and two or more variations at the same time.

Placek M et al (1974)[10] conducted a study to determine the prevalence of various types of labial frenum attachments in upper and lower jaw and the incidence of Pull syndrome with different types of attachments and its significance with age and sex. The study comprised of 465 individuals aged 15 to 40 of both the sexes. The authors derived and used a new classification to determine the labial frenal attachment. The results showed that mucosal attachment was the most common type seen in both upper (46.5%) and lower jaw (92.1%), followed by gingival comprising 34.4% in upper jaw and 6.5 %

in lower jaw, papillary penetrating comprising 16.1% in upper jaw and 1.2% in lower jaw and least is the papillary attachment seen in 3.1% in upper jaw and 0.2 % in lower jaw. The Pull syndrome occurs more in the papillary type (100%) followed by papillary penetrating (84%) then gingival (53.4%) and mucosal (4.5%) in descending order. They concluded that there were no differences found in the prevalence of different types of the labial frenal attachments in relation to age and sex.

Lindsey D (1977)[26] conducted a study to determine the upper midline space and its relation to the maxillary labial frenum in children and adults. A total of 1286 people of both the sexes between the ages 3 and 87 were examined over a period of 6 months, as a minimum criteria for children in whom primary centrals erupted were included in the study. The results showed that the frequency of spacing changed significantly ($P<0.01$) in children, raising from 45% in infants to 68% among children who had only their central incisors erupted and falling to 27% in those with all the upper anteriors erupted. One eighth of the young adults were recorded as having a space but the proportion rose nearly to 23% in older (50 to 59 years) age groups. They concluded that the spacing decreased with the increasing age. In adults there was an evidence of association ($P<0.05$) between spacing and age.

Edwards JG et al (1977)[13] conducted a clinical study to determine the association between midline diastema and abnormal labial frenum. They stated that the clinically abnormal appearing maxillary frenum and a midline

diastema showed a strong, but not absolute, correlation. A certain percentage of patients demonstrated a diastema but not an abnormal frenum or no diastema but an abnormal frenum. The exceptions to the rule were explained by the clinician's inability to differentiate between normal and abnormal frenums.

Popovich FT et al (1977)[27] conducted a study to determine the maxillary interincisal diastema and its relationship to the superior labial frenum and intermaxillary suture. The study comprised of 471 children of age group 9 to 16. Diastema measurements were made using a Boleys gauge on the plaster casts in which 230 cases were found to have diastema. Out of 230 cases with diastema of >0.5 mm at 9 years, the diastema closed completely by 16 years of age in 159 cases. Thirty-three individuals (20.8%) had a frenum with high attachment. The low, thin and thick attachments were found in 66.6% of people. The authors concluded that there was a significant association between the diastema size and frenum type and there was no sex specificity of the occurrence of the diastema. They reported that the frenum attachment moves from coronal to apical position while the movement in the opposite direction was not detected. Children with more coronal attachment levels were the youngest and children with more apical frenal attachment levels were found to be the oldest.

Nainar SM and Gnanasundaram N (1989)[19] conducted a cross-sectional study to find the incidence of the maxillary and mandibular midline diastemas and its etiological factors in South Indian population. A total of 9,774 patients between ages 13-35 years were randomly selected and screened. The sample purification resulted in a research sample of 166 patients with midline diastema. The results showed the incidence of maxillary midline diastema to be 1.6%, which was greater than that of mandibular midline diastema, which was found to be 0.3%. They found that there was no direct etiologic factor for causing the midline diastema.

Hassanali J et al (1993)[29] studied the dental plaster casts of 235 Maasai, 116 Kikuyu children aged 3-16 years to determine the incidence and magnitude of diastemas. The results showed that the highest prevalence of diastema was amongst the Maasai (61.3%) and overjet (99%) amongst the Kikuyu, with values greater than 0.4 mm up to 11.5 mm. Comparison of the mean values showed that diastema (1.77 mm) and overjet (4.4 mm) were greatest in Maasai. In the total sample, the prevalence and mean of diastema were 49%, 1.68 mm; overjet 88.6%, 3.83 mm. They found the prevalence of diastema decreased whilst its magnitude increased with age. The mean values of diastema and overjet were greater amongst the females, but the difference was significant only for overjet.

Kaimenyi et al (1998)[30] conducted a study to determine the prevalence of midline diastema and frenal attachments among school children of Nairobi. A total of 1802 children aged between 4 and 16 years were selected randomly and intra-oral examination was carried out using a mouth mirror under natural light. Labial frenum attachment level was determined by using Placek et al classification. Presence or absence of unusually bigger midline interdental spaces were noted and recorded on a prepared data collection form and data was analyzed manually by Tally method. Results showed, of the total examined, only 35% had upper and lower midline diastema in which 55% were females and 45% were males with the mean age of 7.6 years. The most common location of frenum attachment amongst children with lower midline diastema was the mucogingival junction (86%) whereas amongst those with upper midline diastema it was attached gingiva (50%). None of the children had frenum attachment on the interdental papilla.

Kotlow (1999)[31] has classified anklyglossia (tongue-tie) into four classes based on "free tongue" length. Measurement of the tongue was made based on the distance from the tip of the tongue to the attachment of the frenum at the base of the tongue. A distance of 16 mm was considered normal and clinically acceptable tongue's length, whereas Classes 1 to 4 is categorized as ankyloglossia. The decreasing distance of tongue's length was directly associated with the increasing severity of dysfunction: class 1= 12-16 mm (mild ankyloglossia); class 2= 8-11 mm (moderate ankyloglossia); class

3= 3-7 mm (severe ankyloglossia) and class 4= attachment at the tip of the tongue ((<3mm) complete ankyloglossia).

Dissanayake et al (2003)[32] Conducted a prevalence study to determine the mode of inheritance of midline diastema among 1018 Srilankans (551 males and 467 females) of 20 to 30 years age group. Results showed, of the total sample of 1018 subjects, 91 had median diastema giving an overall prevalence of 9%. Out of 551 males 27 (4.9%) had midline diastema with high frenal attachment and 20 (3.7%) had midline diastema with low frenal attachment and out of 467 females 26 (5.6%) had midline diastema with high frenal attachment and 18 (3.9%) had midline diastema with low frenal attachment. A total of 47 (8.6%) males and 44 (9.4%) females had midline diastema irrespective of the position of the frenal attachment. It was found that there was no significant difference in the prevalence of median diastema between males and females indicating that there is no sexual dimorphism in the trait.

Marchenson IQ (2004)[33] conducted a study to propose a classification for different types of lingual frenum and to relate them to speech disorders. The study comprised of 1402 patients of age groups between 5 years 8 months to 62 years 10 months. Qualitative evaluation of lingual frenum was done by asking the subjects to open the mouth as wide as possible and the frenum was classified as normal frenum and altered frenum (short frenum, normal frenum with anterior insertion and short frenum with anterior insertion). Among the

examined, 127 (9%) had altered type of frenum and the remaining had normal frenal type. Among the subjects with altered frenum, 62 (48.8%) had speech disorders. It was concluded that the altered frenum might predispose the individual to exhibit an accompanying speech disorder.

Maria E Diaz et al (2006)[28] conducted a study to determine the prevalence of different types and insertions of labial frenums as well as midline diastema in 1355 (696 males and 659 females) Peruvian children of age between 0 to 6 years. Clinical examination was conducted by the direct visual method under natural light and consisted of lifting the upper lip with the index finger and thumb of both the hands and employed Sewerin's typology of labial frenum classification, the level of gingival insertion was measured with the ruler from the alveolar border to the frenum's point of insertion in the gingiva and midline diastema was determined by measuring the distance between the midpoints of mesial surface of both central incisors. The results showed the most prevalent frenum was the simple frenum (59%), followed by simple frenum with appendix (42%) and least is the bifid frenum (<1%). The level of gingival insertion increases with age and midline diastema was very wide in younger children and decreases as age increases. It was observed that the wider midline diastema was associated (p=0.001) with a lower gingival insertion and vice versa.

Kirankoora et al (2007)[34] published a case report on Spontaneous closure of midline diastema following frenectomy. A case of a 9-year-old girl with a high frenal attachment that had caused spacing of the maxillary central incisors was reported and frenectomy was done. A spontaneous closure of the midline diastema was noted within 2 months following frenectomy. The patient was followed up for 4 months after which the space remained closed and there was no necessity for an orthodontic treatment at a later stage. He stated, the space can occur either as a transient malocclusion or created by developmental, pathological or iatrogenic factors. The maxillary midline diastema is a common aesthetic problem in mixed and early permanent dentitions. Many innovative therapies varying from restorative procedures such as composite build-up to surgery (frenectomy) and orthodontics are available.

Northcutt ME (2009) [17] conducted a clinical study and performed a visual assessment of tongue shape and lingual frenum in 600 individuals with class I malocclusion over a period of 18 months. The patients were asked to open their mouth as wide as possible and to touch the upper central incisors with the tip of their tongue. The shape and length of the frenum was observed and recorded in an increasing order of severity from N-1 to N-4. The results showed 214 (36%) patients had N-1 frenum followed by N-3 frenum in 194 patients (32%), N-2 frenum in 188 (31%) patients and N-4 frenum in 4 patients (1%).

Sapan H Patel et al (2009)[2] conducted a study to assess the types of frenal morphology according to Sewerin's typology using the direct visual method under natural light, the study comprised of 1206 school going children (637 males and 559 females) between 12 to 17 years of age from six schools in Pune city, Maharashtra. The results showed the most prevalent frenum type was simple frenum (70.6%) followed by simple with nodule (17.6%) and then persistent tectolabial (6.6%). There was one subject each with absence of frenum and double frenum and none with simple frenum with lateral labial or simple with nodule and lateral labial frenum. There was no statistically significant difference between the gender and various frenal morphology.

Gabriel Olaiya Omotoso et al (2010)[35] conducted a study on midline diastema amongst south-western Nigerians. Five hundred and eighty nine self-administered questionnaires were randomly sent to 271 female and 318 male students of the University of Ilorin, whose biological parents were from the southwestern part of Nigeria. Information sought included, presence of (and perception on) diastema in both respondents and their parents. It was found that the incidence of midline diastema was 26.1% (maxillary - 21.0%, mandibular - 1.9%, and both arches- 3.2%). It occurred more frequently in females (33.9%) than males (19.5%), and better appreciated in females (50.6%) than in males (4.1%). A female is more likely to have a maxillary midline diastema (65.3% females: 34.7% males), while a male is more likely to have a mandibular midline diastema (9.1% females: 90.9% males).

Hameedullahjan et al (2010)[36] conducted a study to determine the frequency and etiology of midline diastema on 1800 cases with malocclusions which was reported to the Armed Forces Institute of Dentistry Rawalpindi from 2001 to 2007 at the Department of Orthodontics. Sample purification resulted in a research sample of 1747 patients. The data of all patients was analyzed as regards to age, gender, presence of diastema and its etiological findings. They found that 12.59% of cases had midline diastema and no single etiological factor was found responsible for midline diastema, however increased over jet was the most frequently (56.56%) occurring factor, followed by high frenal attachments (33.03%). It was finally concluded that maxillary midline diastema was a common entity associated with multifactorial etiology.

Boutsi EA et al (2011)[37] conducted a study to examine the prevalence of the various types of maxillary labial frenum attachment in 226 children between 1 to 18 years age of different ethnic groups attending Public Health Clinic of Lavirion (Greece). Clinical examination was done in the dental chair under adequate lighting and frenum attachment was categorized into four types according to Placek et al classification. Among 226 examined 63 were 1-6 years old, 140 were 7-12 years old and 23 were 13-18 years old comprising 119 males and 107 females with ethnic back ground of Greek (51.1%), Albanian (20%), Turkish (12%) and Afghan (11%). The results of the study showed that the most common type of attachment is the gingival type (41.6%) followed by papillary penetrating (26.1%) then papillary (22.1%) and mucosal (10%). It was also found that mucosal type being most prevalent in the older age group and papillary penetrating in the younger ones. The study

concluded that, in children, ethnic background and gender are not associated with maxillary labial frenum attachments, whereas age is strongly associated.

Preeti Bhattacharya et al (2011)[38] conducted a study to determine the role of various etiological factors associated with midline diastema. The sample consisted of 40 patients of various age groups with midline diastema due to variable etiology. On examination, they found that 6 of the diastemas are of abnormal labial frenum, 6 of mesiodens, 8 of anodontia or microdontia, and 8 of para functional habits, 6 of flared or rotated central and 6 of dentoalveolar disproportion with otherwise healthy periodontium.

MATERIALS AND METHODS

The present epidemiological study was conducted by the Department of Pedodontics and Preventive Dentistry, Ragas Dental College & Hospital, Chennai. Ethical clearance for the study was obtained from the Institutional Review Board of Ragas Dental College and Hospital.

Initially 1120 school going children were examined for the study. Among them 169 children who were not meeting the inclusion criteria were excluded from the study. Finally, 951 children of both the sexes from 3-14 years age were included in the study with the following inclusion and exclusion criteria.

Inclusion criteria

1. Healthy children of both sexes from 3 to 14 years of age who are willing to participate in the study with consent form signed by parents.
2. Presence of healthy maxillary anterior teeth.
3. Healthy gingiva

Exclusion criteria[28]

1. Children with congenital/ developmental/ acquired orofacial anomalies affecting the hard and soft tissues.
2. History of trauma in the anterior portion of the maxilla.
3. Children with interproximal caries or restoration on the upper central incisors and/or any alterations in the size and shape of the incisors.
4. Any oral habits and/or any type of previous orthodontic/periodontal treatments.
5. History of surgical intervention in maxillary labial/ and mandibular lingual region.
6. Patient's on medication which are known to affect gingiva

Materials:

Examination was carried out with the following instruments

- Mouth mirrors
- Gloves
- Tissue paper
- Dettol

- Soap
- Sterillium
- Cotton
- Kidney tray
- Scoring sheets, pencils

Methods:

Clinical examination:

A single investigator examined all the children and a trained assistant did data entry. Clinical examination was done by direct visual method under natural light by gently lifting the upper lip with the index finger and thumb using both the hands.[28] This allowed for the observation and classification of the labial frenum for attachment level and morphology and also allowed to observe for the presence or absence of midline diastema. The lingual frenum was assessed by visual examination. Children's were asked to open their mouth as wide as possible and then asked to touch the tip of the upper central incisors with the tip of their tongue. The shape and the length of the frenum were observed and classified as N-1 to N-4 in order of increasing severity,[17] based solely on appearance. All the findings were recorded in the proforma and data was analyzed statistically.

Intra examiner reproducibility was checked by random reexamination of 10 % of sample and the kappa value was determined as 0.830.

Labial frenum: Attachment level

Classification of Frenal attachment: (Placek M et al classification 1974)[10]

Mucosal: frenum inserting upto and including the mucogingival junction with no evidence of crossing into the attached gingiva.

Gingival: frenum inserting into the attached gingiva and not extending coronal to the line demarcating the base of the midline papilla that was defined as the line connecting the gingival zeniths of the central incisors.

Papillary: frenum inserting coronal to the line demarcating the base of the midline papilla without any visible evidence of frenum extension to the palatal aspect or of blanching anywhere on the palatal aspect of the midline papilla or on the incisive papilla even when further tension was applied to the frenum.

Papillary penetrating: frenum inserting coronal to the line demarcating the base of the midline papilla combined with visible evidence of frenum extension to the palatal aspect or of blanching anywhere on the palatal aspect of the midline papilla or on the incisive papilla when further tension was applied to the frenum.

Labial frenum: Morphology

Classification of Morphology: (Modified Sewerin's typology 1971)[18]

Simple frenum

Simple frenum with appendix

Simple frenum with nodule

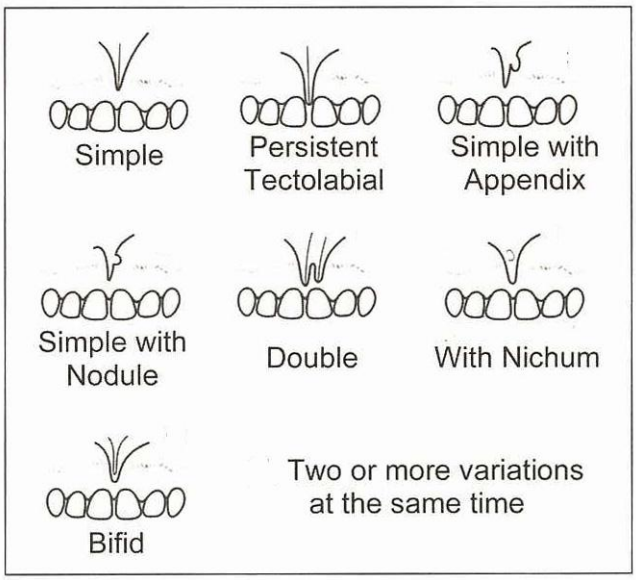
Persistent tectolabial

Double

Simple frenum with nichum

Bifid frenum

Two or more variations at the same time



Lingual frenum:

Classification of lingual frenum (Northcutt ME 2009)[17]

N-1: The frenum constrains the normal mobility of tongue limiting its ability to reach the incisal edges of the upper anterior teeth when the mouth is wide open.

N-2: Short lingual frenum, stronger than N-1 and usually thick. An N-2 frenum pulls on the tongue with sufficient force to form a sulcus tip or on the underside of the tongue.

N-3: shorter and stronger than N-2, creates sufficient force to distort the whole tongue, forming a pronounced “U or V” shape at the tip.

N-4: frenum attached to the tip of the tongue and affects speech.

Data collected were categorized as 3-6 years, 7-12 years and 13-14 years and statistically analyzed using Statistical Package for Social Sciences (Version 11). These age groups were made on the assumption that children between 3-6 years have primary teeth, children between 7-12 years have both primary and permanent teeth and children between 13-14 years have only permanent teeth. The maxillary labial frenum was evaluated for its attachment levels and morphology by using Chi square test. The lingual frenum was evaluated using Chi square test. Mean age of labial and lingual frenum was evaluated by one-way ANOVA followed by Post-Hoc Tukey HSD test. Association of attachment levels, morphology and midline diastema was evaluated by Chi square association test.

FIGURE 1: MATERIALS USED FOR SURVEY

RESULTS

A total of 951 children in the age group 3-14 years were examined for labial and lingual frenum attachments, morphology and midline diastema.

Table 1 and Graph 1 shows the distribution of sample according to gender in all three age groups. Among the total of 951 examined, in 3-6 years there were 126 males and 103 females. In 7-12 years, there were 267 males and 265 females and in 13-14 years, there were 96 males and 94 females. There was no statistical (P=0.455) difference between the distribution of males and females in all three age groups.

Table 2 and Graph 2 shows children's age by labial frenum insertion levels in which 602 children had mucosal attachment with the mean age being 10.29±2.595 years, 255 had gingival attachment with the mean age as 8.42±3.483 years, 69 had papillary type with the mean age of 8.10±3.177 years and 25 had papillary penetrating type with the mean age of 5.68±1.930 years. Age differs significantly (P=0.000) among children with different attachment levels except between gingival and papillary types not being significantly different from each other (P=0.151). Children with mucosal type were the oldest while children with papillary penetrating type were the youngest among all age groups.

Table 2a and Graph 2a shows the prevalence of maxillary labial frenum attachment level according to age and gender. In 3-6 years age group, the most prevalent frenum attachment was found to be the gingival type seen in 133 subjects, followed by mucosal type (n=50), papillary type (n=29) and papillary penetrating type (n=17) in descending order. In 7-12 years age group, the most prevalent frenum attachment level was the mucosal type seen in 392 subjects followed by gingival type (n=94), papillary type (n=38) and the least was the papillary penetrating type (n=8) in descending order. In 13-14 years age group, the most prevalent frenum attachment level is the mucosal type seen in 160 subjects followed by gingival type (n=28), and the least is the papillary type (n=2) in a descending order. There was no statistical difference between males and females in relation to distribution of attachment level in all the three age groups (3-6 years p value =0.065, 7-12 years p value= 0.565, 13-14 years, p=0.175).

Table 3 and Graph 3 shows the prevalence of maxillary labial frenum morphology according to age and gender. In 3-6 years age group, simple type (n=196) of frenum was the most prevalent followed by nodule (n=21), appendix (n=8) and tectolabial (n=4) in a descending order. In 7-12 years, simple frenum (n=459) was the most prevalent type followed by appendix (n=37), nodule (n=18), tectolabial (n=16) and the least being double frenum (n=2). In 13-14 years, simple frenum was the most prevalent (n=167) followed by appendix (n=15), nodule (n=5) and the least being tectolabial (n=3). Other

frenum types (simple with nichum, bifid and two or more variations at the same time) were not present in the study sample. There was no statistical difference between males and females in relation to distribution of morphological types in all the three age groups (3-6 years (P=0.965), 7-12 years (P= 0.134), 13-14 years (P=0.773)).

Table 4 and Graph 4 shows children's age by lingual frenum types in which 870 subjects had N-1 frenum with the mean age of 9.34±3.219 years, 70 had N-2 frenum with the mean age of 7.99±3.255 years, 10 had N-3 frenum with the mean age of 6.20±0.632 years and 1 had N-4 with the mean age of 6±0.000 years. With the increase in the mean age, the lingual frenum attachment level prevalence changed to the N-1 type which was statistically significant (P=0.000).

Table 4a and Graph 4a shows the prevalence of lingual frenum types. Among the 3-6 years age group N-1 frenum (n=193) was the most prevalent type followed by N-2 frenum (n=28), N-3 frenum (n=7) and least being the N-4 (n=1) in a descending order. In this group N-2 frenum was more prevalent in males (n=23) compared to females (n=5) (P=0.014). In 7-12 years age group N-1 frenum (n=496) was found to be the most prevalent type followed by N-2 frenum (n=33) and least being N-3 frenum (n=3). In 13-14 years age group only two types of frenum attachment were seen among which 181 subjects had N-1 type of frenum and 9 had N-2 type of frenum. There was no

statistical difference between males and females in relation to distribution of lingual frenum types in 7-12 years (P= 0.195) and 13-14 years (P=0.708)

Table 5 and Graph 5 shows the evaluation of association between labial frenum attachment and midline diastema. In 3-6 years age group, out of 50 individuals with mucosal type, only 14 had midline diastema, out of 133 of the gingival attachment, 42 had midline diastema, out of 29 of papillary type, 8 had midline diastema and out of 17 of papillary penetrating type, 8 had midline diastema. In 7-12 years of age group, out of 392 individuals with mucosal type, 104 had midline diastema, out of 94 with the gingival attachment, 15 had midline diastema, out of 38 of papillary type, 6 had midline diastema and out of 8 of papillary penetrating type, 2 had midline diastema. In 13-14 years of age group, out of 160 with mucosal type, 9 had midline diastema, out of 28 with the gingival attachment, 9 had midline diastema and out of 2 with papillary type, 1 had midline diastema. There was no statistical association between the attachment levels of maxillary labial frenum and midline diastema in 3-6 years age group (P=0.494) and 7-12 years age group (P=0.105), while there was an association between attachment levels and midline diastema in 13-14 years age group (P=0.000) with regard to papillary type of attachment.

Table 6 and Graph 6 shows evaluation of association between frenum morphology and midline diastema. Out of 822 children with simple frenum morphology, only 188 had midline diastema. Out of 60 children with appendix

type, 11 had midline diastema, out of 44 children with nodular type, 9 had midline diastema, out of 23 children with tectolabial type, 9 had midline diastema, out of 2 of double frenum type one had diastema. There was no statistical association between the morphological types and midline diastema (P=0.275).

Table 7 and Graph 7 shows evaluation of association between labial frenum morphology and attachment levels. Out of 822 children with simple frenum 520 had mucosal type, followed by 221 with gingival, 61 with papillary and least being papillary penetrating in 20 individuals. Out of 60 children with appendix type, 38 had mucosal, 16 had gingival, 4 had papillary and 2 had papillary penetrating. Out of 44 children with nodular type, 21 had mucosal, 17 had gingival, 4 had papillary and 2 had papillary penetrating. Out of 23 children with tectolabial, 21 had mucosal, one had gingival and one had papillary penetrating. Out of 2 children with double frenum, both had mucosal type of attachment. There was no statistical association between the morphological types and the attachment levels (P=0.222).

TABLE 1: SAMPLE DISTRIBUTION

AGE GROUPS	MALES	FEMALES	TOTAL
	n (%)	n (%)	n (%)
3-6 years	126 (13.25)	103 (10.83)	229 (24.08)
7-12 years	267 (28.08)	265 (27.87)	532 (55.95)
13-14 years	96 (10.09)	94 (9.88)	190 (19.97)
TOTAL	489 (51.42)	462 (48.58)	951 (100)
P VALUE	0.455 (NS)		

No statistical (P=0.455) (Chi square test) difference between distribution of males and females in all three age groups.

P> 0.05= Not significant (NS)

P≤ 0.05 - P≥0.01 = Moderately significant (**)

P≤0.01 = Highly significant (***)

TABLE 2: CHILDREN'S AGE BY LABIAL FRENUM ATTACHMENT LEVEL

ATTACHMENT LEVELS	n (%)	MEAN AGE (IN YEARS) ± S.D
MUCOSAL	602 (63.30)	10.29 ±2.595 ^{A,B}
GINGIVAL	255 (26.81)	8.42±3.483^{A}
PAPILLARY	69 (7.26)	8.10±3.177^{A}
PAPILLARY PENETRATING	25 (2.63)	5.68±1.930 ^{B}
P VALUE	0.000***	

Age differs significantly (P=0.000***) (one-way ANOVA) among children with different attachment levels except between gingival and papillary types being not significantly different from each other (P=0.151). Children with mucosal were the oldest while children with papillary penetrating were the youngest among all. (^{A,B} groups connected by same letter are not significant to each other, Tukey HSD test) .

P> 0.05= Not significant (NS)

P≤ 0.05 - P≥0.01 = Moderately significant (**)

P≤0.01 = Highly significant (***)

TABLE 2a: PREVALENCE OF MAXILLARY LABIAL FRENUM ATTACHMENT LEVELS ACCORDING TO AGE AND GENDER

AGE GROUPS	GENDER	ATTACHMENT LEVELS				TOTAL	P VALUE
		MUCOSAL	GINGIVAL	PAPILLARY	PAPILLARY PENETRATING		
		n (%)	n (%)	n (%)	n (%)	n (%)	
3-6 years	MALES	35 (70)	71 (53.4)	13 (44.8)	7 (41.2)	126 (55)	0.065 (NS)
	FEMALES	15 (30)	62 (46.6)	16 (55.2)	10 (58.8)	103 (45)	
TOTAL		50 (100)	133 (100)	29 (100)	17 (100)	229 (100)	
7-12 years	MALES	193 (49.2)	53 (56.4)	17 (44.7)	4 (50)	267 (50.2)	0.565 (NS)
	FEMALES	199 (50.8)	41 (43.6)	21 (55.3)	4 (50)	265 (49.8)	
TOTAL		392 (100)	94 (100)	38 (100)	8 (100)	532 (100)	
13-14 years	MALES	83 (51.9)	11 (39.3)	2 (100)	-	96 (50.5)	0.175 (NS)
	FEMALES	77 (48.1)	17 (60.7)	-	-	94 (49.5)	
TOTAL		160 (100)	28 (100)	2 (100)	-	190 (100)	

There is no statistical difference between males and females in relation to distribution of attachment levels in all the three age groups group (3-6 years P =0.065, 7-12 years P= 0.565, 13-14 years P=0.175) (Chi square test)

P> 0.05= Not significant (NS)

P≤ 0.05 - P≥0.01 = Moderately significant (MS) (**)

P≤0.01 = Highly significant (S) (***)

TABLE 3: PREVALENCE OF MAXILLARY LABIAL FRENUM MORPHOLOGY ACCORDING TO AGE AND GENDER

AGE GROUP	GENDER	MORPHOLOGICAL TYPE								TOTAL	P VALUE
		Simple frenum	Simple with Appendix	Simple with Nodule	Persistent Tectolabial	Double frenum	Simple with nichum	Bifid	Two or more variations		
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
3-6 years	MALES	107(54.6)	5 (62.5)	12 (57.1)	2 (50)	-	-	-	-	126 (55)	0.965 (NS)
	FEMALES	89 (45.4)	3 (37.5)	9 (42.9)	2 (50)	-	-	-	-	103 (45)	
TOTAL		196 (100)	8 (100)	21 (100)	4 (100)	-	-	-	-	229 (100)	
7-12 years	MALES	223(48.6)	21 (56.8)	9 (50)	12 (75)	2 (100)	-	-	-	267 (50.2)	0.134 (NS)
	FEMALES	236(51.4)	16 (43.2)	9 (50)	4 (25)	-	-	-	-	265 (49.8)	
TOTAL		459 (100)	37 (100)	18 (100)	16 (100)	2 (100)	-	-	-	532 (100)	
13-14 years	MALES	83 (49.7)	9 (60)	3 (60)	1 (33.3)	-	-	-	-	96 (50.5)	0.773 (NS)
	FEMALES	84 (50.3)	6 (40)	2 (40)	2 (66.7)	-	-	-	-	94 (49.5)	
TOTAL		167 (100)	15 (100)	5 (100)	3 (100)	-	-	-	-	190 (100)	

No statistically significant difference between males and females in relation to distribution of morphological types in all the three Age groups (3-6 years P =0.965, 7-12 years P = 0.134, 13-14 years P=0.773) (Chi square test)

TABLE 4: CHILDREN'S AGE BY LINGUAL FRENUM TYPES

LINGUAL FRENUM TYPES	n (%)	MEAN AGE (IN YEARS)±S.D
N-1	870 (91.48)	$9.34\pm3.219^{A,B}$
N-2	70 (7.36)	7.99 ± 3.255^{B}
N-3	10 (1.06)	6.20 ± 0.632^{A}
N-4	1 (0.10)	6 ± 0.0^{A}
P VALUE	0.000***	

With the increase in the mean age, the most prevalent lingual frenum attachment level was N-1 type which was statistically significant (P=0.000***) (one-way ANOVA). (^{A,B} groups connected by same letter are not significant to each other, Tukey HSD test) (P=0.153).

P> 0.05= Not significant (NS)

P≤ 0.05 - P≥0.01 = Moderately significant (**)

P≤0.01 = Highly significant (***)

TABLE 4a: PREVALENCE OF LINGUAL FRENUM TYPES

AGE GROUPS	GENDER	ATTACHMENT LEVELS				TOTAL	P VALUE
		N-1	N-2	N-3	N-4		
		n (%)	n (%)	n (%)	n (%)	n (%)	
3-6 years	MALES	98 (50.8)	23 (82.1)	4 (57.1)	1 (100)	126 (55)	0.014**
	FEMALES	95 (49.2)	5 (17.9)	3 (42.9)	-	103 (45)	
TOTAL		193 (100)	28 (100)	7 (100)	1 (100)	229 (100)	
7-12 years	MALES	249 (50.2)	15 (45.5)	3 (100)	-	267 (50.2)	0.195 (NS)
	FEMALES	247 (49.8)	18 (54.5)	-	-	265 (49.8)	
TOTAL		496 (100)	33 (100)	3 (100)	-	532 (100)	
13-14 years	MALES	92 (50.8)	4 (44.4)	-	-	96 (50.5)	0.708 (NS)
	FEMALES	89 (49.2)	5 (55.6)	-	-	94 (49.5)	
TOTAL		181 (100)	9 (100)	-	-	190 (100)	

No statistical difference exists between males and females in relation to distribution of lingual frenum types in 7-12 years (P= 0.195) and 13-14 years age group (P=0.708). Whereas in 3-6 years age group N-2 is most prevalent in males (n=23) compared to females (n=5) (P=0.014**) (Chi-square test).

P> 0.05= Not significant (NS)
P≤ 0.05 - P≥0.01 =Moderately significant (**)
P≤0.01 = Highly significant (***)

TABLE 5: EVALUATION OF ASSOCIATION BETWEEN ATTACHMENT AND MIDLINE DIASTEMA

AGE GROUPS	ATTACHMENTS	MIDLINE DIASTEMA		TOTAL n (%)	P VALUE
		Yes n (%)	No n (%)		
3-6 years	Mucosal	14 (28)	36 (72)	50 (100)	0.494 (NS)
	Gingival	42 (31.6)	91 (68.4)	133 (100)	
	Papillary	8 (27.6)	21 (72.4)	29 (100)	
	Papillary penetrating	8 (47.1)	9 (52.9)	17 (100)	
	TOTAL	72	157	229	
7-12 years	Mucosal	104(26.5)	288(73.5)	392 (100)	0.105 (NS)
	Gingival	15(16)	79(84)	94 (100)	
	Papillary	6(15.8)	32(84.2)	38 (100)	
	Papillary penetrating	2(25)	6(75)	8 (100)	
	TOTAL	127	405	532	
13-14 years	Mucosal	9(5.6)	151(94.4)	160 (100)	0.000 ***
	Gingival	9(32.1)	19(67.9)	28 (100)	
	Papillary	1(50)	1(50)	2 (100)	
	Papillary penetrating	-	-	-	
	TOTAL	19	171	190	

No statistical association exists between the attachment levels and midline diastema in 3-6 years age group (P=0.494) and 7-12 years age group (P=0.105), whereas there was an association between attachment levels and midline diastema in 13-14 years age group (P=0.000***) (Chi square association test) with regard to papillary type of attachment.

P> 0.05= Not significant (NS)

P≤ 0.05 - P≥0.01 = Moderately significant (**)

P≤0.01 = Highly significant (***)

TABLE 6: EVALUATION OF ASSOCIATION BETWEEN FRENUM MORPHOLOGY AND MIDLINE DIASTEMA

AGE GROUPS	MORPHOLOGY	MIDLINE DIASTEMA		TOTAL n (%)
		YES n (%)	NO n (%)	
3-14 YEARS	SIMPLE	188 (22.9)	634 (77.1)	822 (100)
	APPENDIX	11 (18.3)	49 (81.7)	60 (100)
	NODULE	9 (20.5)	35 (79.5)	44 (100)
	TECTOLABIAL	9 (39.1)	14 (60.9)	23 (100)
	DOUBLE FRENUM	1 (50)	1 (50)	2 (100)
TOTAL		218 (22.9)	733 (77.1)	951 (100)
P VALUE	0.275 (NS)			

No statistical association exists between the morphological types and midline diastema (P=0.275) (Chi-square association test).

P> 0.05= Not significant (NS)

P≤ 0.05 - P≥0.01 = Moderately significant (**)

P≤0.01 = Highly significant (***)

TABLE 7: EVALUATION OF ASSOCIATION BETWEEN LABIAL FRENUM MORPHOLOGY AND ATTACHMENT LEVELS

AGE GROUPS	MORPHOLOGY	ATTACHMENT LEVELS				TOTAL n (%)	P VALUE
		Mucosal n (%)	Gingival n (%)	Papillary n (%)	Papillary penetrating n (%)		
3-14 years	Simple	520 (63.3)	221 (27)	61 (7.4)	20 (2.4)	822 (100)	0.222 (NS)
	Appendix	38 (63.3)	16 (26.7)	4 (6.7)	2 (3.3)	60 (100)	
	Nodule	21 (47.7)	17 (38.6)	4 (9.1)	2 (4.5)	44 (100)	
	Tectolabial	21 (91.3)	1 (4.3)	-	1 (4.3)	23 (100)	
	Double frenum	2 (100)	-	-	-	2 (100)	
TOTAL		602 (63.3)	255 (26.8)	69 (7.3)	25 (2.6)	951 (100)	

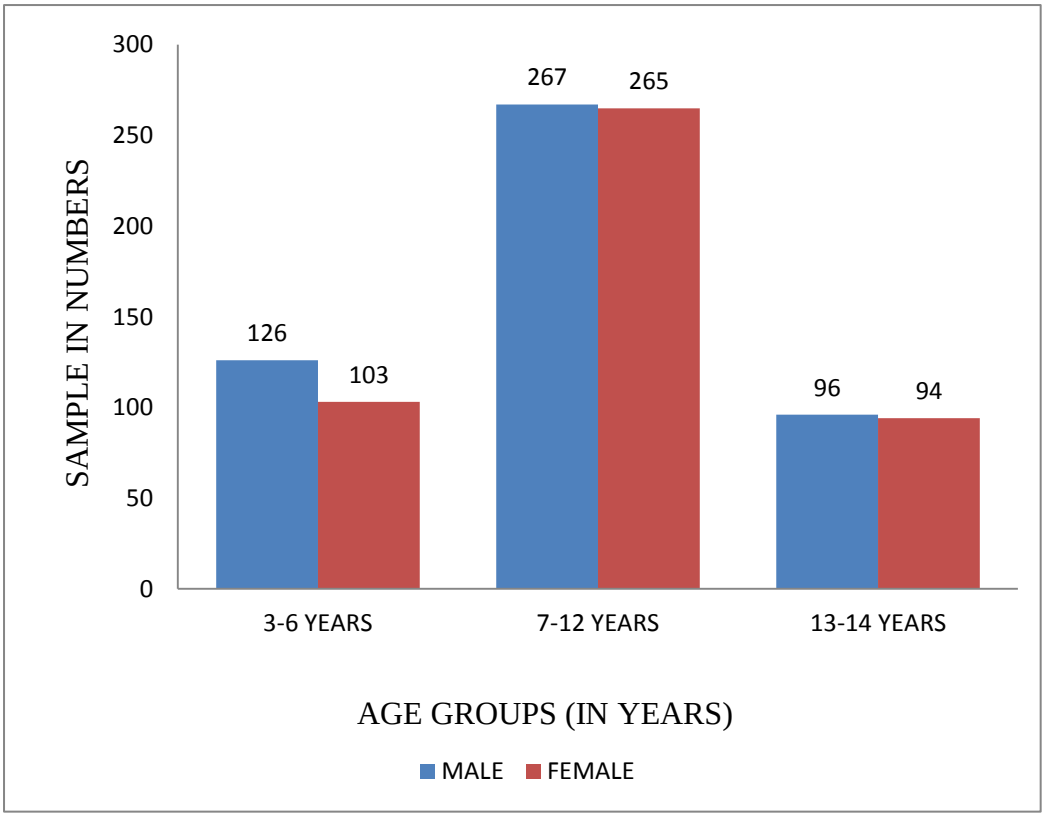
No statistical association exists between the morphological types and attachment levels (P=0.222) (Chi-square association test).

P> 0.05= Not significant (NS)

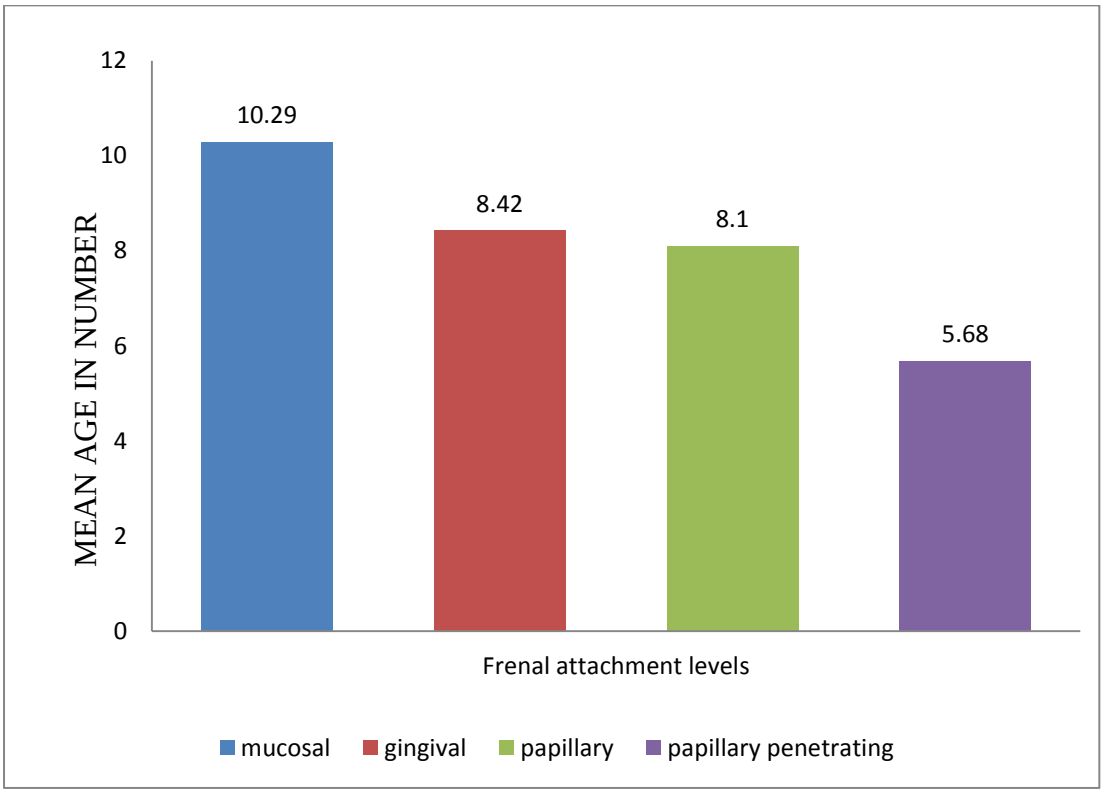
P≤ 0.05 - P≥0.01 = Moderately significant (**)

P≤0.01 = Highly significant (***)

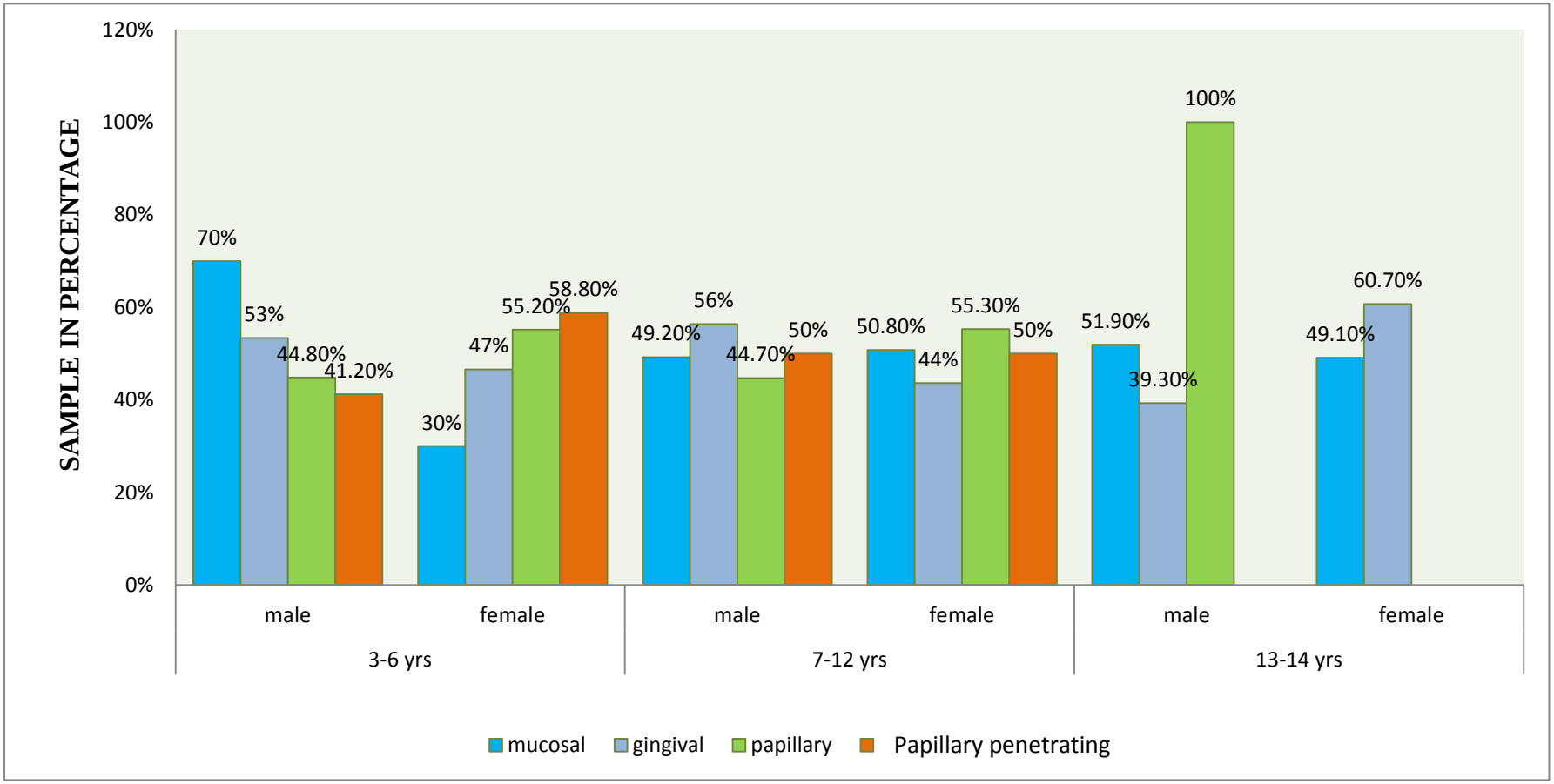
GRAPH 1: SAMPLE DISTRIBUTION



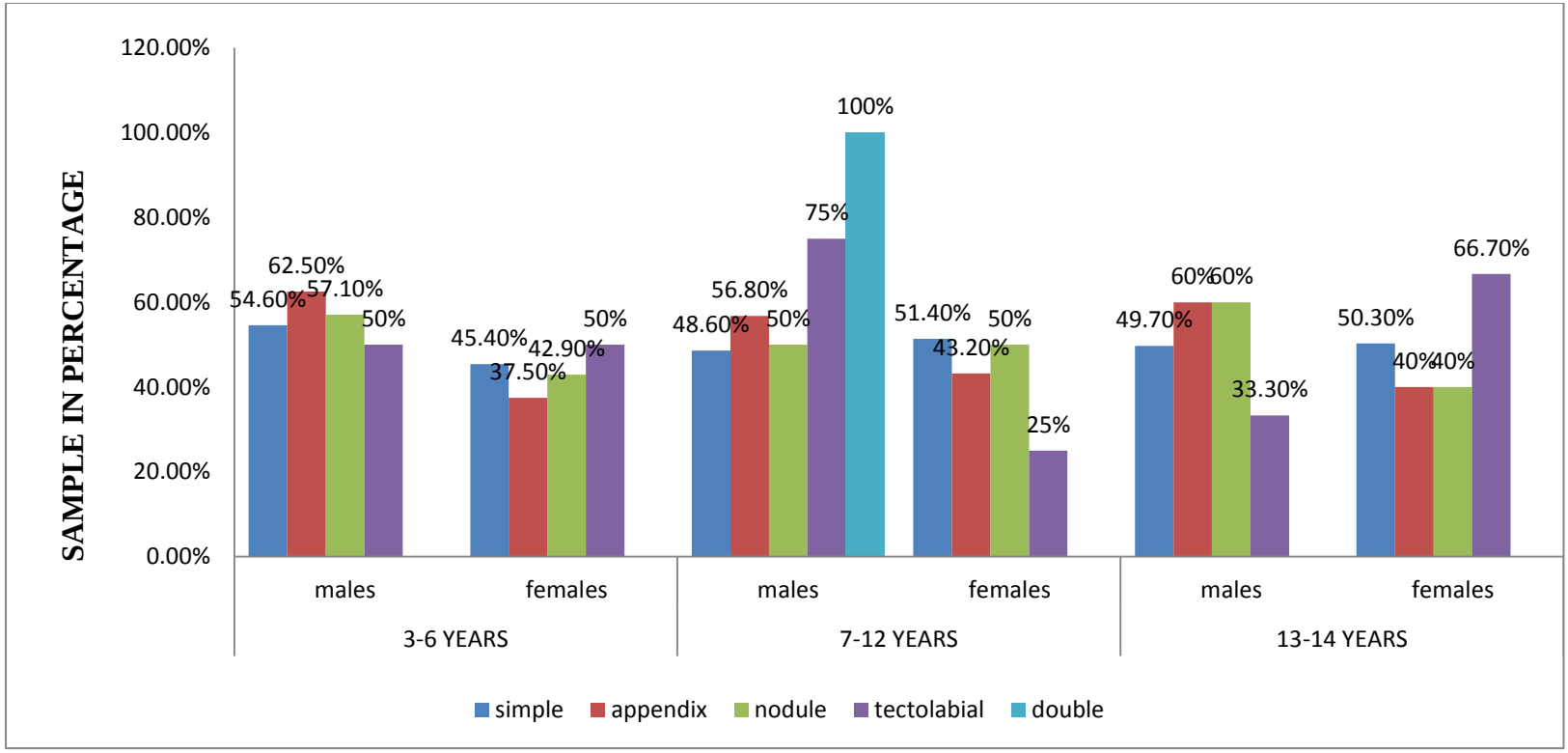
GRAPH 2: CHILDREN'S AGE BY LABIAL FRENUM ATTACHMENT LEVEL



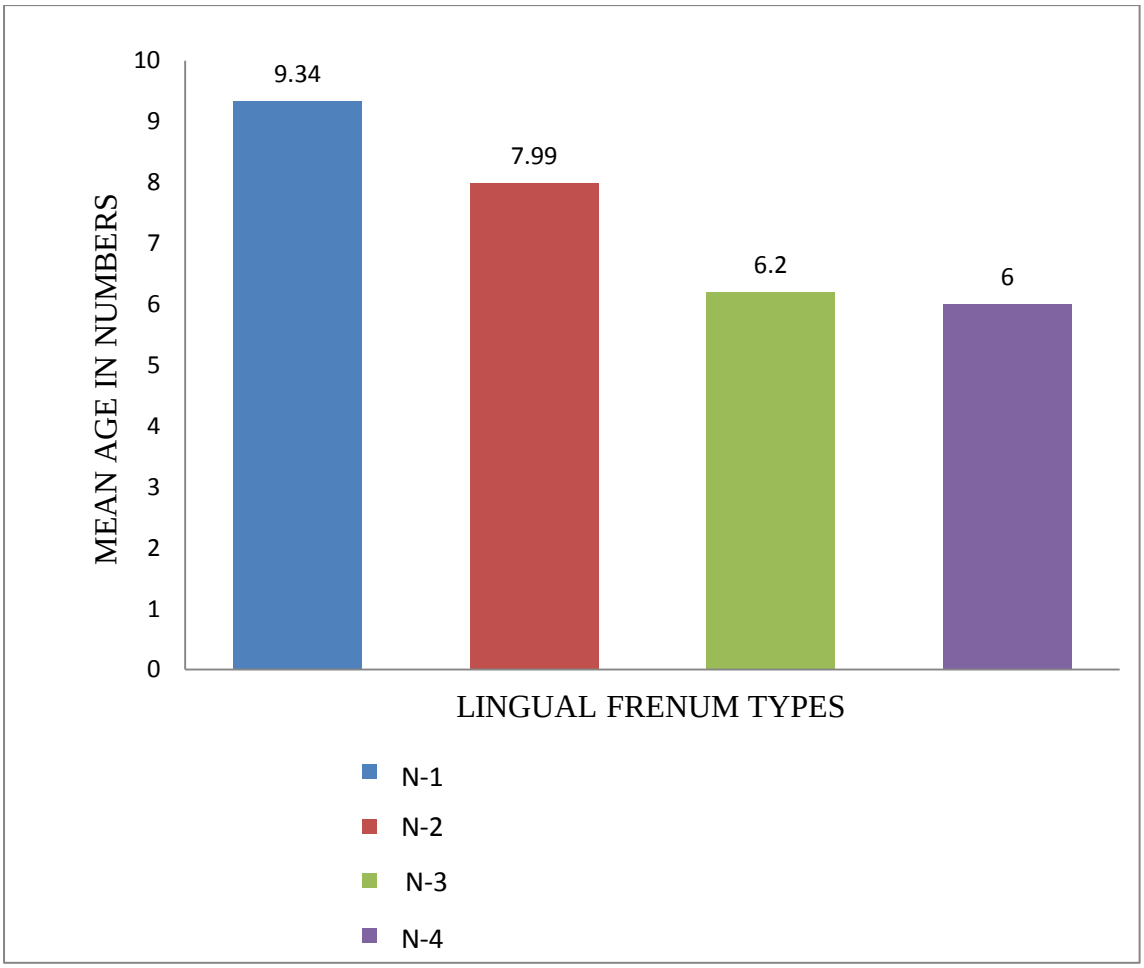
GRAPH 2a: PREVALENCE OF MAXILLARY LABIAL FRENUM ATTACHMENT LEVEL ACCORDING TO AGE AND GENDER



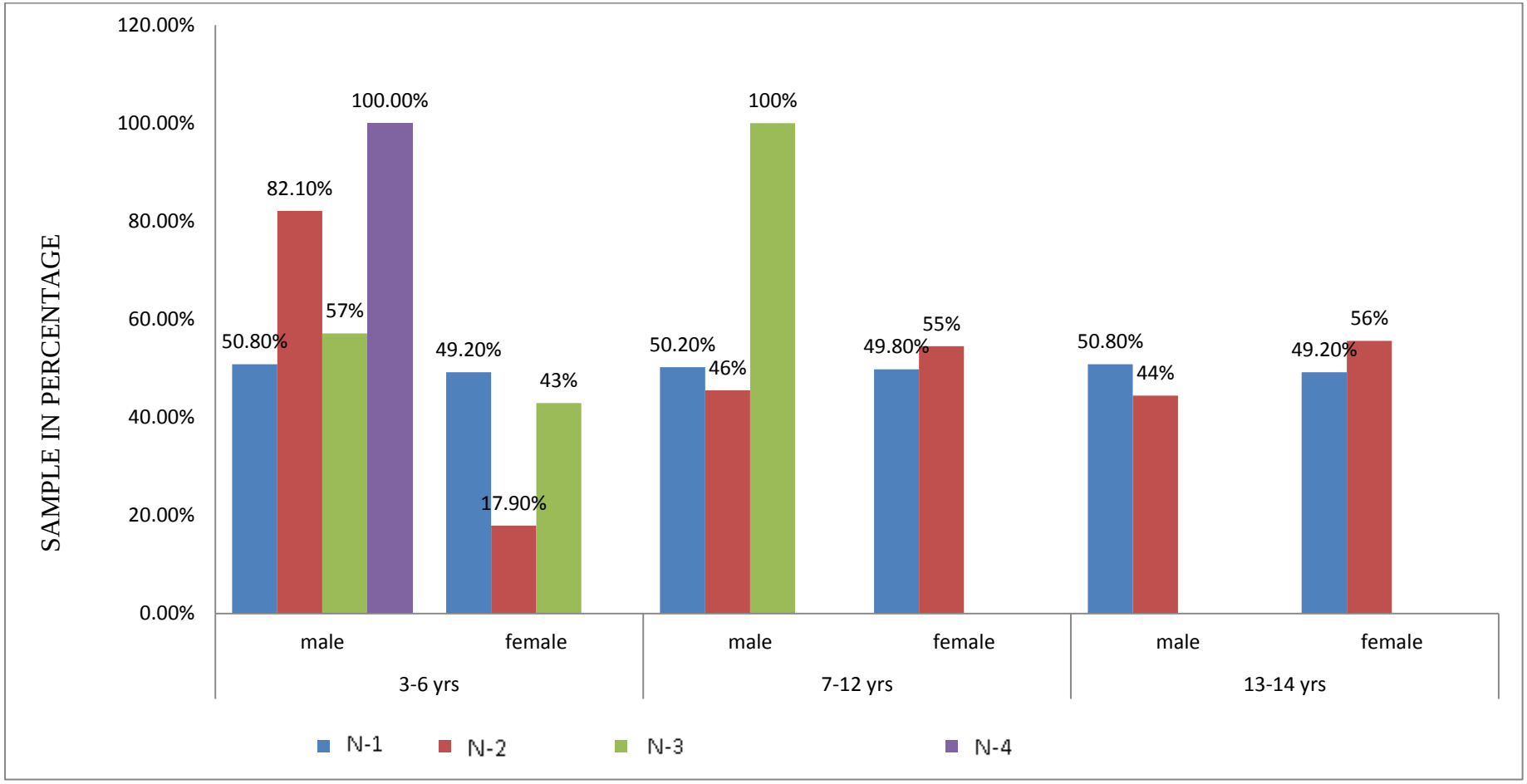
GRAPH 3: PREVALENCE OF MAXILLARY LABIAL FRENUM MORPHOLOGY ACCORDING TO AGE AND GENDER



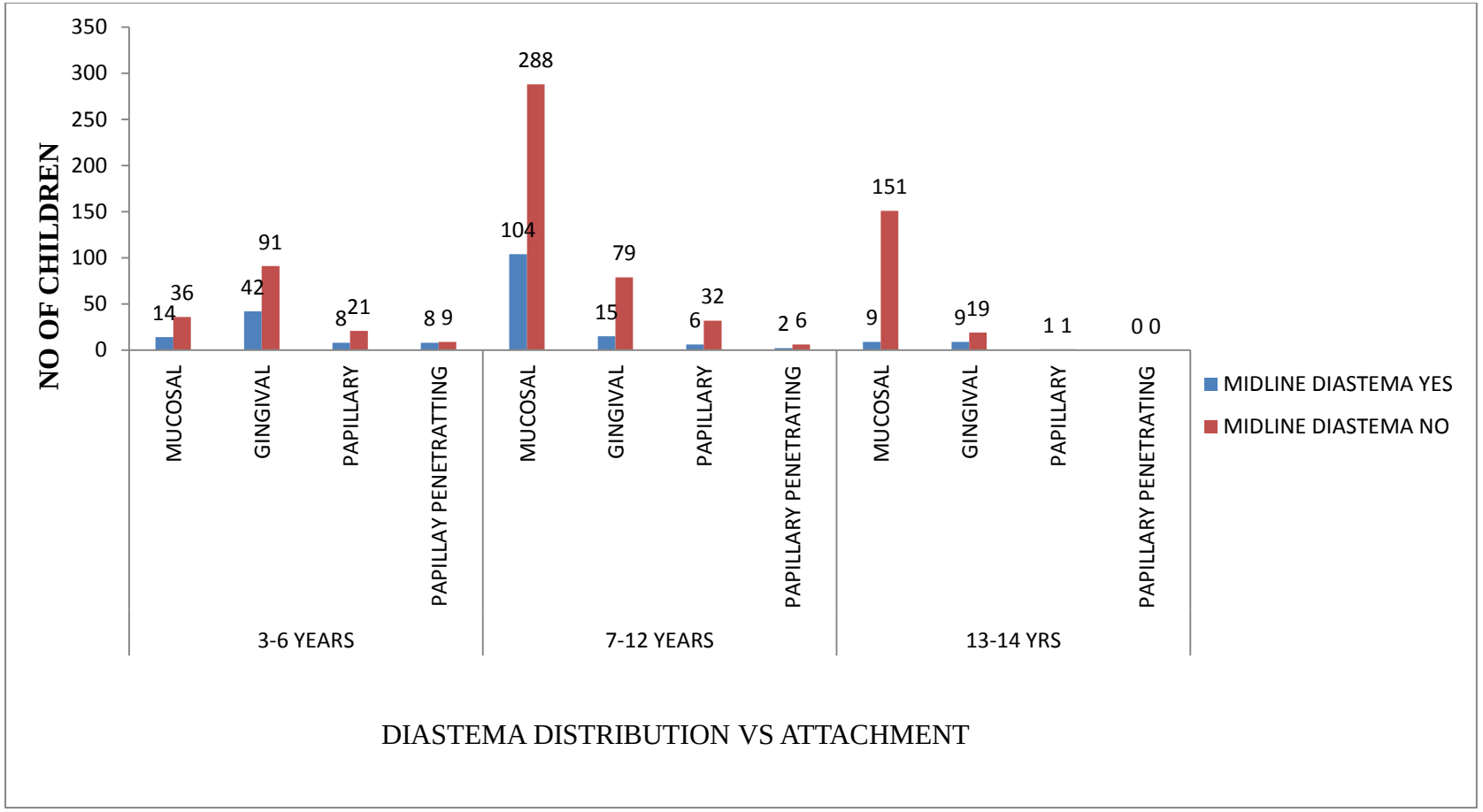
GRAPH 4: CHILDREN'S AGE BY LINGUAL FRENUM TYPES



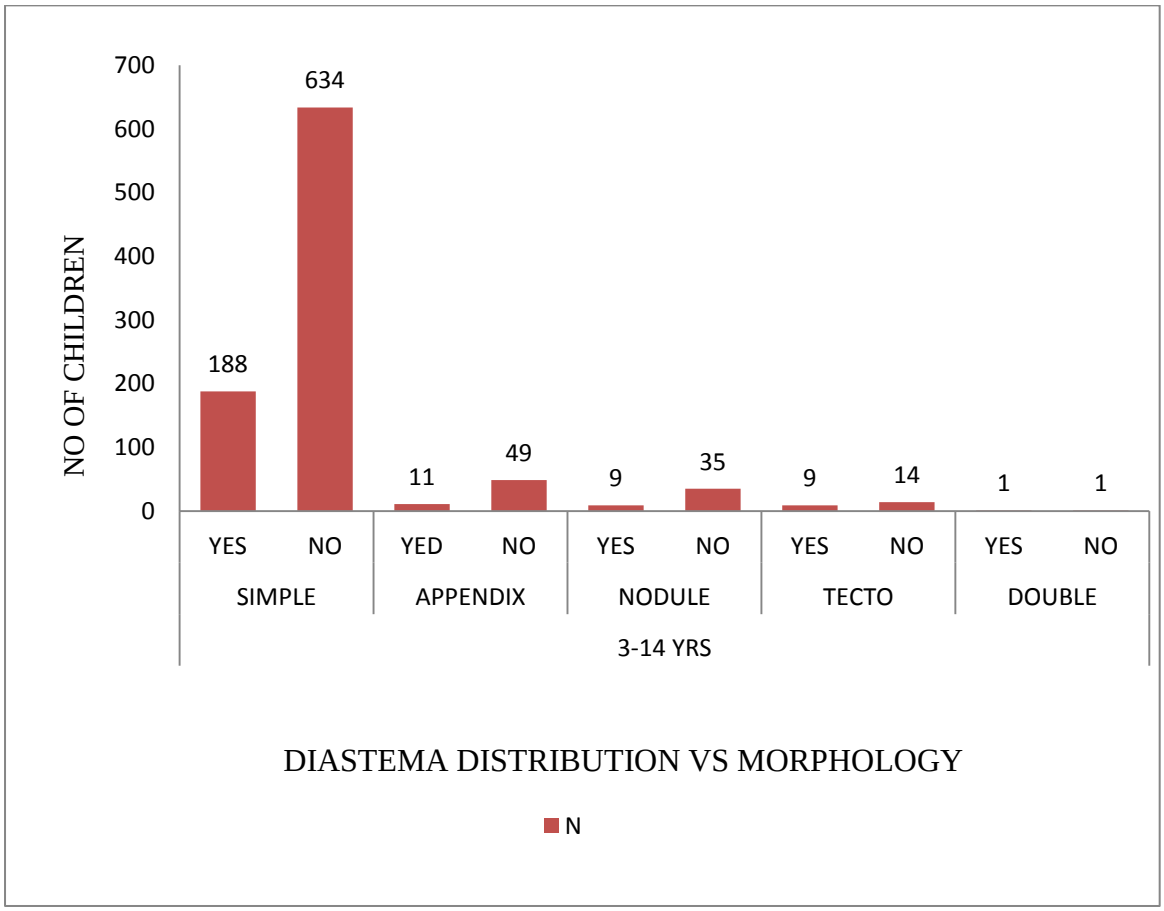
GRAPH 4a: PREVALENCE OF LINGUAL FRENUM TYPES



GRAPH 5: EVALUATION OF ASSOCIATION BETWEEN ATTACHMENT AND MIDLINE DIASTEMA



GRAPH 6: EVALUATION OF ASSOCIATION BETWEEN FRENUM MORPHOLOGY AND MIDLINE DIASTEMA



GRAPH 7: EVALUATION OF ASSOCIATION BETWEEN LABIAL FRENUM MORPHOLOGY AND ATTACHMENT LEVELS

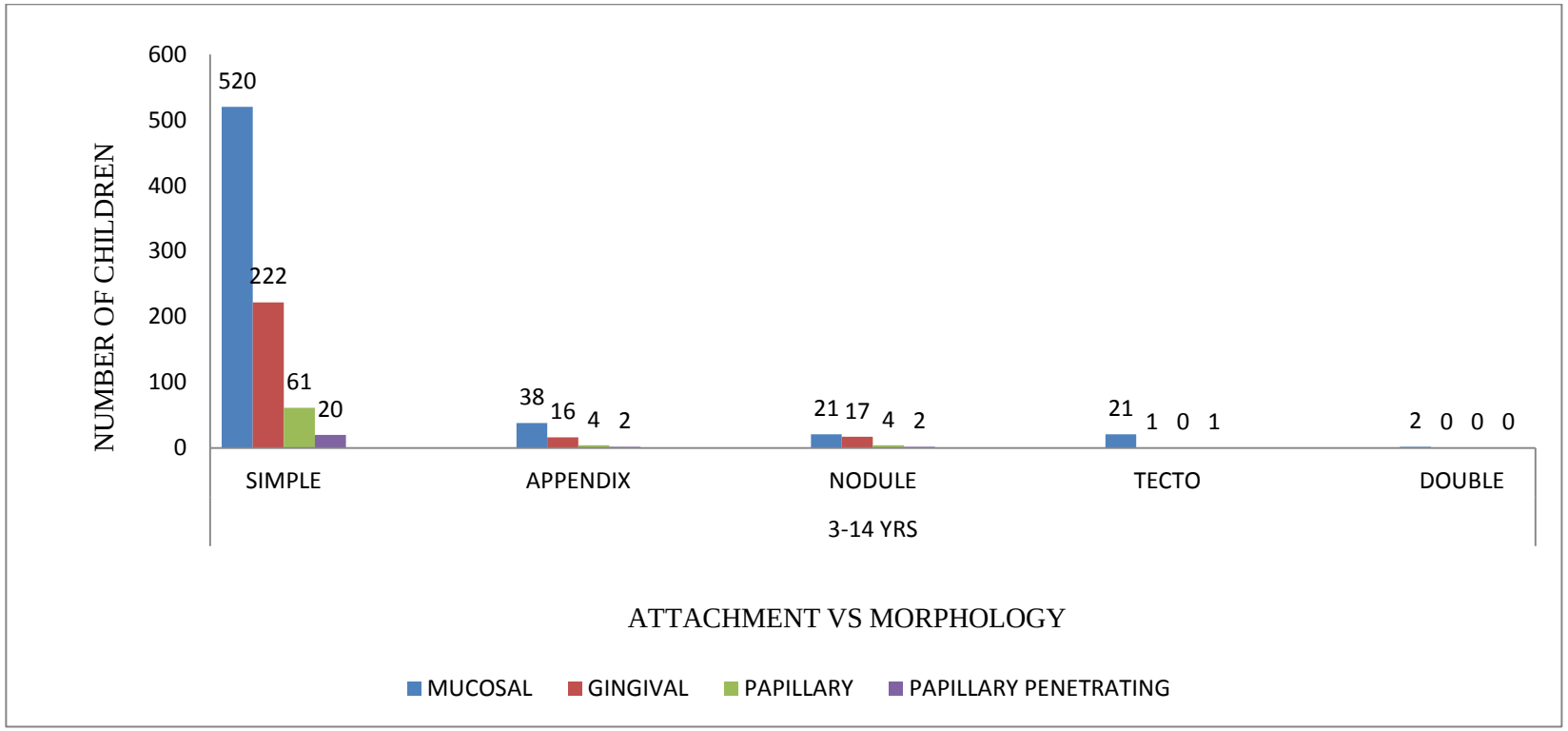


FIGURE 2: DIFFERENT LEVELS OF MAXILLAY LABIAL FRENUM ATTACHMENTS

MUCOSAL

GINGIVAL

PAPILLARY

PAPILLARY PENETRATING

FIGURE 3: DIFFERENT TYPES OF MAXILLARY LABIAL FRENUM MORPHOLOGY

SIMPLE FRENUM

SIMPLE FRENUM WITH APPENDIX

SIMPLE FRENUM WITH NODULE

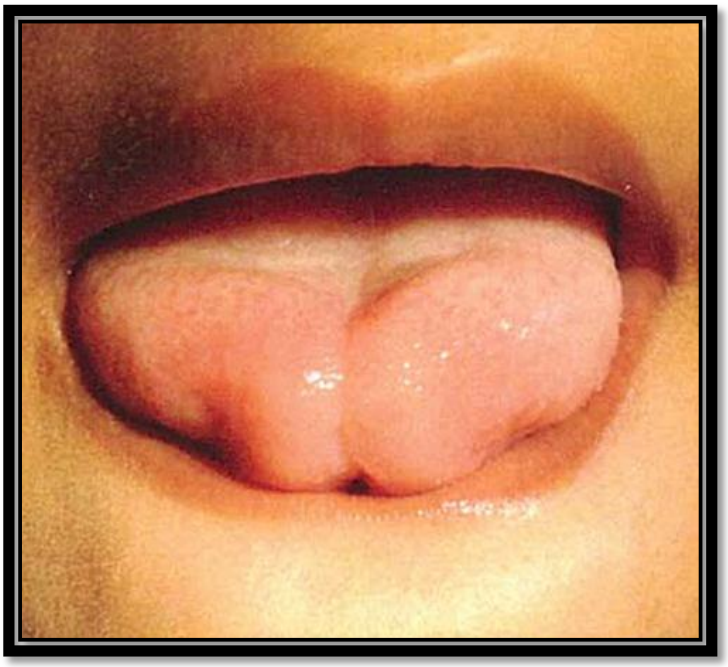
PERSISTENT TECTOLABIAL

DOUBLE FRENUM

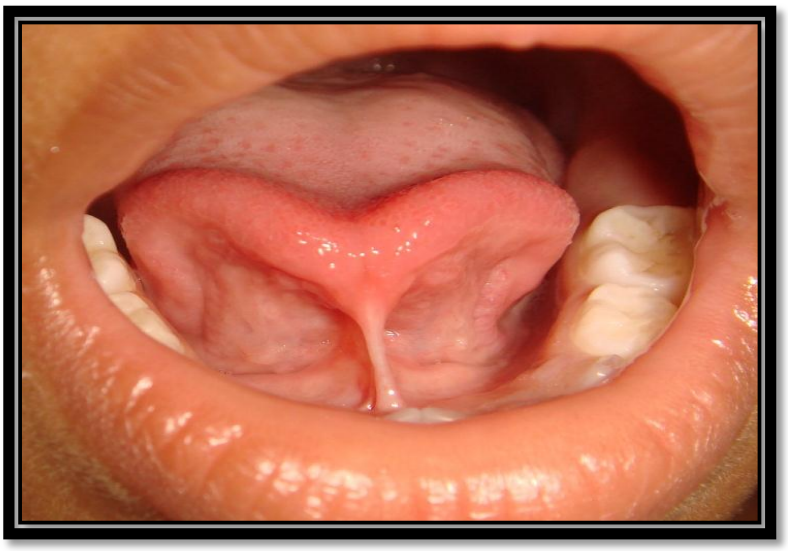
FIGURE 4: LINGUAL FRENUM ATTACHMENT LEVELS

N-1

N-2



N-3



N-4

FIGURE 5: MIDLINE DIASTEMA

PRESENCE OF MIDLINE DIASTEMA

ABSENCE OF MIDLINE DIASTEMA

DISCUSSION

The anterior frenum is a combination of epithelium and connective tissue.[25,39,40] In some instances, the frenum may include muscle fibers originating from orbicularis oris muscle of the upper lip. The frenum may attach at variable locations in the attached gingival tissue and the anterior papillae inserting into the palate. In some instances the frenum may be completely absent.[31] In the newborn, a tight maxillary frenum alone or in conjunction with ankyloglossia may interfere with proper latching of an infant to a mother's breast.[41, 42] The maxillary frenum may interfere with lip flanging and prevent nursing.[31] This may result in the mother prematurely giving up attempts at breastfeeding. Infant oral examinations at birth may disclose a maxillary frenum attachment inserting into the alveolar ridge and in severe cases extending between central incisors and inserting into the palate.

As the infant grows, this tissue may reposition itself away from the alveolar ridge or may cause diastema to develop between maxillary central incisors.[31] An existence of a diastema between the maxillary incisors may be a normal growth stage. Completion of mixed dentition stage of tooth eruption often reveals that this gap closes spontaneously as the remaining anterior teeth erupt. Diagnosis and treatment of the frenum as it relates to the diastema must include such things as elimination of contributing factors such as digit habits, tongue thrusting, pacifiers or presence of supernumerary teeth. An abnormally placed frenum may influence the growth and development of the anterior

portion of the maxillary arch. When the frenum is wide and thick and causes blanching of the anterior papilla and when diastema is greater than 2 mm active intervention by frenectomy may be indicated.[43]

The tight frenum may cause the lip to get caught between the central incisors. A tight or abnormal frenal attachment may also contribute to the failure of traumatic injuries to the area to heal, interfere with adequate oral hygiene, contribute to facial caries, restrict movement of the lip, contribute to speech abnormalities and create undesirable esthetics in the anterior teeth.[31] When an oral examination concludes that the frenum is the contributing cause of oral problems, early revision may prevent more serious problems from occurring at a later age. For successful management of the frenum related problems one should have a thorough knowledge about the frenal morphology and changes that take place during growth and about the management of the frenal related problems. Hence the present cross sectional study was conducted among 951 school going children of 3-14 years age group to assess the labial frenum for attachment levels, morphology and its relation to diastema.

There are several studies in the literature on the attachment of maxillary labial frenum in children, adolescents and adults.[2,10,26,28,37,44,45] The frenal attachment classification schemes used by different authors, however, vary and previous studies provided inadequate and incomplete information regarding the employed criteria or included only juvenile population sample of

limited age range or did not include other information such as data analysis. The present study sample included the subjects of primary, mixed and permanent dentition of 3-14 years age range with a mean age of 9.20 years. The study sample selection was in accordance with the studies done by Boutsi EA et al,[37] Kaimenyi[30] and differed from other studies in which only children with primary dentition,[8,28] children or adolescents with mixed and permanent dentition[46,47] and adult samples[2,10,18] were analyzed. Even though this was not a longitudinal study, the sample allowed for the observation of the characteristics (morphology and insertion) presented by the labial frenum, lingual frenum and the presence of midline diastema at the age range of 3-14 years.

The clinical Assessment of maxillary labial frenal attachment level were done according to Placek et al[10] which was followed in the studies done by Kaimenyi et al,[30] Boutsi E.A,[37] Bergese.[48] Frenal morphology was assessed according to Sewerin's typology,[18] since the majority of the studies viewed this classification as practical, useful and easy to use.[18, 28] Lingual frenum was assessed by visual examination for its shape and length according to Northcutt ME.[17]

The present cross-sectional study was conducted among 951 school going children of 3-14 years age group to assess the labial and lingual frenal attachments, morphological types, midline diastema and their associations. The frenum dynamically changes[4,5] as the age advances and observed that the

gingival insertion level increases in length with the age advancement.[37] Hence the sample distribution in this study included the subjects of 3-6 years, 7-12 years and 13-14 years age group (Table 1).

The present study results (Table 2, 2a) shows that mucosal type of attachment was prominent in 63.30% of children and the least common is the papillary penetrating type (2.63%) and there is a shift in the percentage of distribution of attachment level from papillary penetrating to mucosal as the mean age increases (P=0.000***). Our study results were comparable to the findings of Maria Diaz et al,[28] Bergese et al[48] (primary dentition) and Popovich et al[27] done on the mixed dentition and Sapan H Patel,[2] Placek M et al,[10] Lindsey D et al,[26] Kaimenyi et al,[30] Boutsi EA et al,[37] Addy et al[44] and Janczuk and Banach[45] on permanent dentition.

The present study (Table 3) found the presence of five types of frenal morphology with simple frenum (3-6 years n=196, 7-12 years n=459, 13-14 years n=167) being the most common morphological type and the least prevalent is double frenum (7-12 years n=2) while simple frenum with nichum, bifid and two or more variations at the same time were not found. These results were similar to the findings of Sapan H patel[2] and Maria E Diaz et al, [28] except for the presence of other frenal types in their study.

In the present study (Table 4) N-1 frenum (91.48%) was the most prevalent lingual frenum and N-4 (0.10%) was the least prevalent. There was a shift in the distribution of lingual frenal attachment level (Table 4a) from

N-4 type to N-1 as the mean age increases (p=0.000***). This is in accordance with the study done by Northcutt ME.[17] The present study findings suggest that both labial and lingual frenum migrated from coronal to apical with increase in age. The data obtained with the qualitative or quantitative (or both) classifications of lingual frenum, should always be analyzed together with the clinical history and with the data found in the clinical examination.[33]

On evaluation of association between the labial frenal attachment levels and midline diastema (Table 5), all the type of attachment levels showed the presence of diastema in all the age groups. However, Chi square association test showed no association between gingival insertion level and midline diastema in primary dentition (P=0.494 NS) and mixed dentition (P=0.105 NS) age group where as in permanent dentition there is a significant association which is inversely related (P=0.000***). These results confirms that the persistence of the more coronal attachment level (papillary, papillary penetrating) was associated with diastema as were seen in other studies like Lindsey D[26] who reported a strong association between spacing and blanching both in children and adults and Maria E Diaz et al.[28]

The results of the present study shows no association between frenal morphology and diastema (Table 6) (P=0.275 NS) and frenal morphology and attachment levels (Table 7) (P=0.222 NS). We could not come across any comparative studies in the literature about the association between morphology, diastema and attachment levels to compare with our results.

In the present study, simple frenum is the most prevalent type of morphology and mucosal level of gingival insertion was the most commonly seen. As age increases, there was a shift in the frenum insertion level from papillary to mucosal type. No association between level of attachment and frenal morphology, frenal morphology and diastema was found in primary and mixed dentition age groups where as in permanent dentition, an inverse relation was obtained between level of insertion and midline diastema. The present cross sectional study is an attempt to find the prevalence and relation between different maxillary labial frenal morphologies, insertion levels and diastema among children and about the prevalence of various types of lingual frenum. In addition, the qualitative nature of the present study is worth mentioning where we could not establish a relation between frenal morphology to diastema as well as to the insertion level while quantification of all the parameters would give a better picture. Future studies should aim at quantifying (X-Rays and study models) diastema and frenal width and attachments using a larger sample.

CONCLUSION

Labial frenum, a small anatomic landmark in the oral cavity was found to have diversification in morphology and gingival insertion level which may insist the importance for careful assessment during intra oral examination and also tells that other contributing factors along with the frenum should be kept in mind when there is a presence of midline spacing to obtain a correct diagnosis and establish an adequate treatment plan.

Within the limitations of this study

It can be concluded that

1) Mucosal type of maxillary labial frenal attachment was the most prevalent type of attachment in 7-12 years and 13-14 years and, while in 3-6 years gingival type was the most prevalent.
2) The level of gingival insertion increases with the increase in the mean age.
3) There was no statistical significant difference between genders regarding the frenal attachment levels in all three age groups.
4) Simple frenal morphology was the most prevalent followed by simple with nodule and double frenum was the least prevalent.
5) There was no statistical significant difference between genders regarding the frenal morphological types in all three age groups.

6) N-1 lingual frenum was the most prevalent and the least prevalent was the N-4 type of lingual frenum.
7) With the increase in the mean age, the most prevalent lingual frenum attachment was the N-1 type which was statistically significant (P=0.000***)
8) Persistence of papillary and papillary penetrating type of frenal attachment in permanent dentition may cause midline diastema.
9) There was a significant association exist between the papillary type of gingival insertion level and the midline diastema in permanent dentition.
10) There was no correlation between frenal morphology and midline diastema and also between frenal morphology and frenal attachment levels.

SUMMARY

The present cross sectional study was done to determine the prevalence of labial and lingual frenum attachments, labial frenum morphology and their association with midline diastema. A total of 951 children of 3-14 years age group from various schools of Chennai city were clinically examined and data were recorded and statistically analyzed.

The present study finding shows that the most prevalent labial frenum attachment type was found to be mucosal (N=602) and least is the papillary penetrating (N=25), the most prevalent type of morphology is simple (N=822) in all three dentition and least being the double frenum (N=2) while other types of frenum were absent (simple with nichum, bifid and two or more variations at the same time). The attachment levels shifted from papillary penetrating to mucosal with increase in the mean age which was statistically significant (p=0.000***).

The most common type of lingual frenum is the N-1 frenum (N=870) and the least is the N-4 type of lingual frenum (N=1). When there is an increase in the age, the greater prevalence of lingual frenum attachment changed from N-4 type to N-1 type which was statistically significant (p=0.000***).

No association exists between morphological type and midline diastema (p=0.275 NS) and between morphology and attachment level (p=0.222 NS).

It can be concluded that the attachment of frenum in children will shift to a more apical position with increasing age and no gender differences were noticed. There was no association between morphology and attachment level and also between morphology and diastema. The dentists need to give due importance for frenum assessment during oral examination and treatment planning.

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ANNEXURE-I

CLINICAL ASSESSMENT OF MAXILLARY LABIAL AND MANDIBULAR LINGUAL FRENUM AND RELATIONSHIP BETWEEN THE UPPER MIDLINE SPACE AND MAXILLARY LABIAL FRENUM IN 3-14 YEARS SCHOOL GOING CHILDREN OF CHENNAI CITY

Name: Age: Sex: M/F Parent name:

School: Phone number:

1) **MORPHOLOGY OF LABIAL FRENUM:** morphology of the maxillary labial frenum is to be examined by lifting of the upper lip of the child gently with index finger and thumb of both the hand.

   Simple frenum

   Simple frenum with appendix

   Simple frenum with nodule

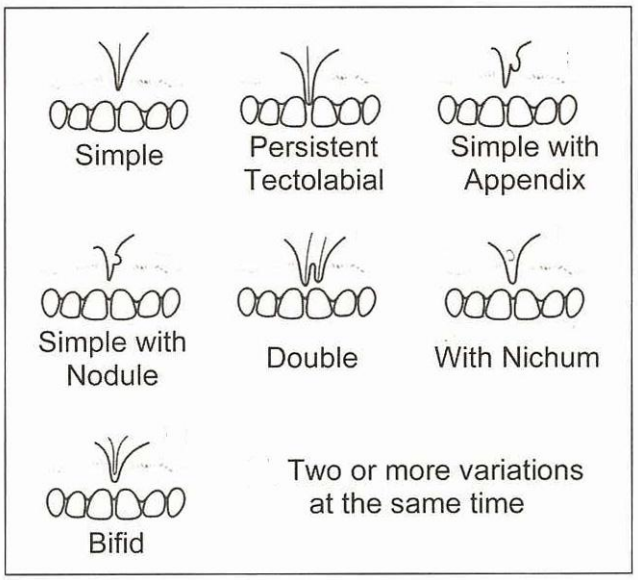
   Persistent tectolabial

   Double frenum

   Simple frenum with nichum

   Bifid frenum

   Two or more variations at the same time



2) **<u>ATTACHMENT OF LABIAL FRENUM:</u>** The clinical attachment of labial frenum is to be examined by lifting of the upper lip of the child gently with index finger and thumb of both the hand.

Mucosal: 

Gingival: 

Papillary: 

Papillary penetrating: 

3) **LINGUAL FRENUM:** lingual frenum to be assessed by visual examination, asking the children's to open the mouth as wide as possible and then asked to toush the tip of the upper central incisors with the tip of their tongue.

N-1 

N-2 

N-3 

N-4 

4) **MIDLINE DIASTEMA**:

Absent Present

ANNEXURE- II

CONSENT FORM

I_____, the parent/guardian of_____, herby give consent for the participation of my son/daughter in the study titled "Clinical assessment of Maxillary labial and Mandibular lingual frenum and Relationship between the upper midline space and Maxillary labial frenum in 3-14 years school going Children of Chennai City" being conducted by Dr.S.Rajakumar, a postgraduate student of Ragas Dental College and Hospital, Chennai. Under the guidance of Dr.M.Jayanthi, Prof and Head, Department of Pedodontics and Preventive Dentistry. I have been clearly informed about the procedure/techniques of the study and I voluntarily, unconditionally, freely give my consent for the active participation of my child without any form of pressure and in a mentally and conscious state.

Signature of the Investigating Doctor

Signature of the Patient's Parent/ Guardian

ANNEXURE-III

சிகிச்சை ஒப்புதல் படிவம்

_____ஆகிய நான் _____ என்கிற

(பெற்றோரின் பெயர்) *(குழந்தையின் பெயர், வயது)*

என் குழந்தையின் வாய்/பல் பகுதியை ஆராய்ந்து பார்க்க ஒப்புதல் அளிக்கிறேன். மேலும், இந்த ஆராய்ச்சியினை மேற்கொள்வதினால் விளையக்கூடிய நன்மைகளையும், அதனால் விளையக்கூடிய அசௌகரியங்களையும் அறியப்பெற்றப்பின், நான் எவ்வித அச்சமுமின்றி தன்னிச்சையாகவும், முழுமனதுடன் என்னுடைய சம்மதத்தினை அளிக்கிறேன்.

கையொப்பம் :

தேதி, இடம் :

சாட்சிகள் ;